02. Team Organization

NASA ESMD Capstone Design

developed by

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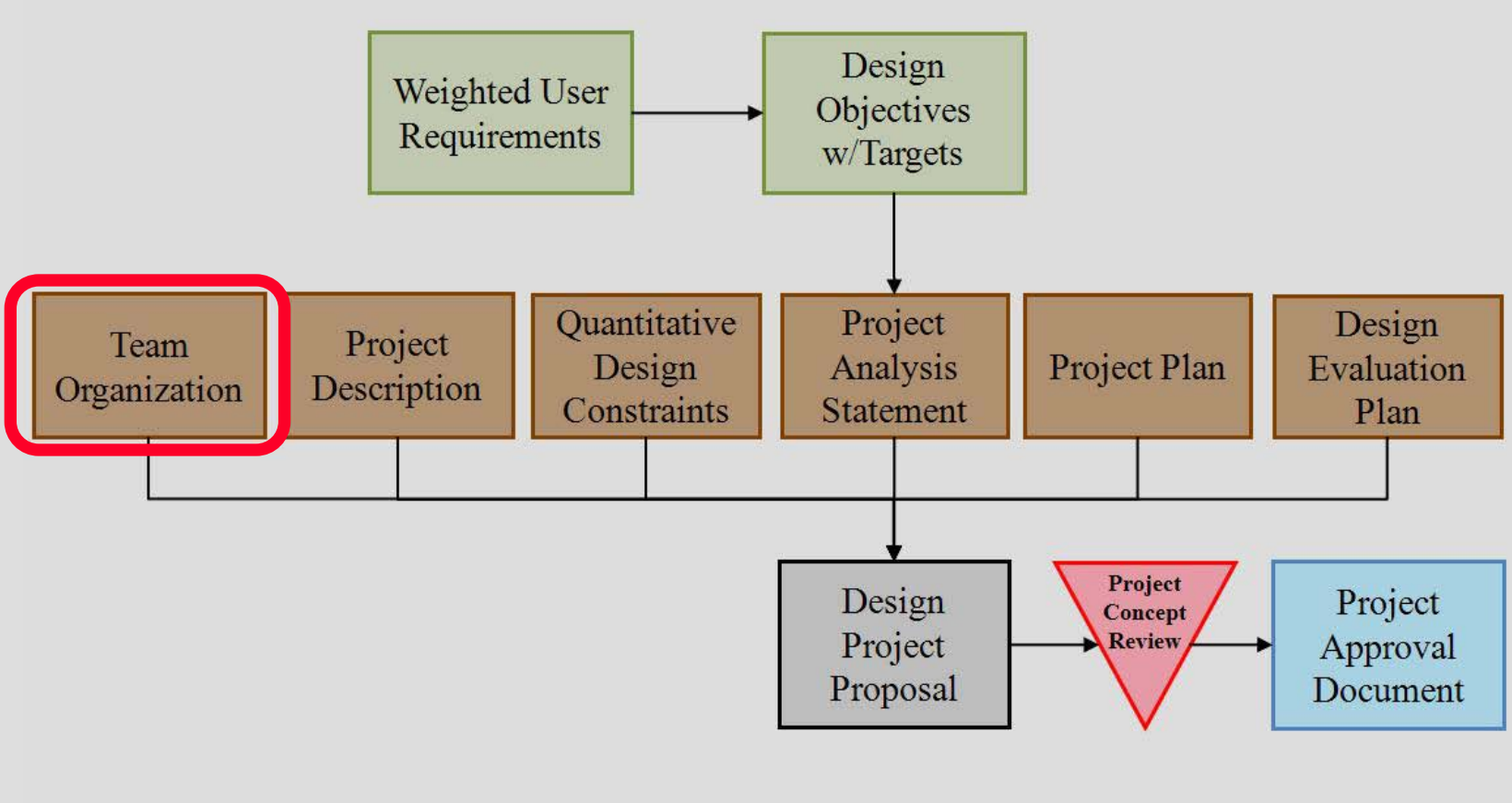
Acknowledgement

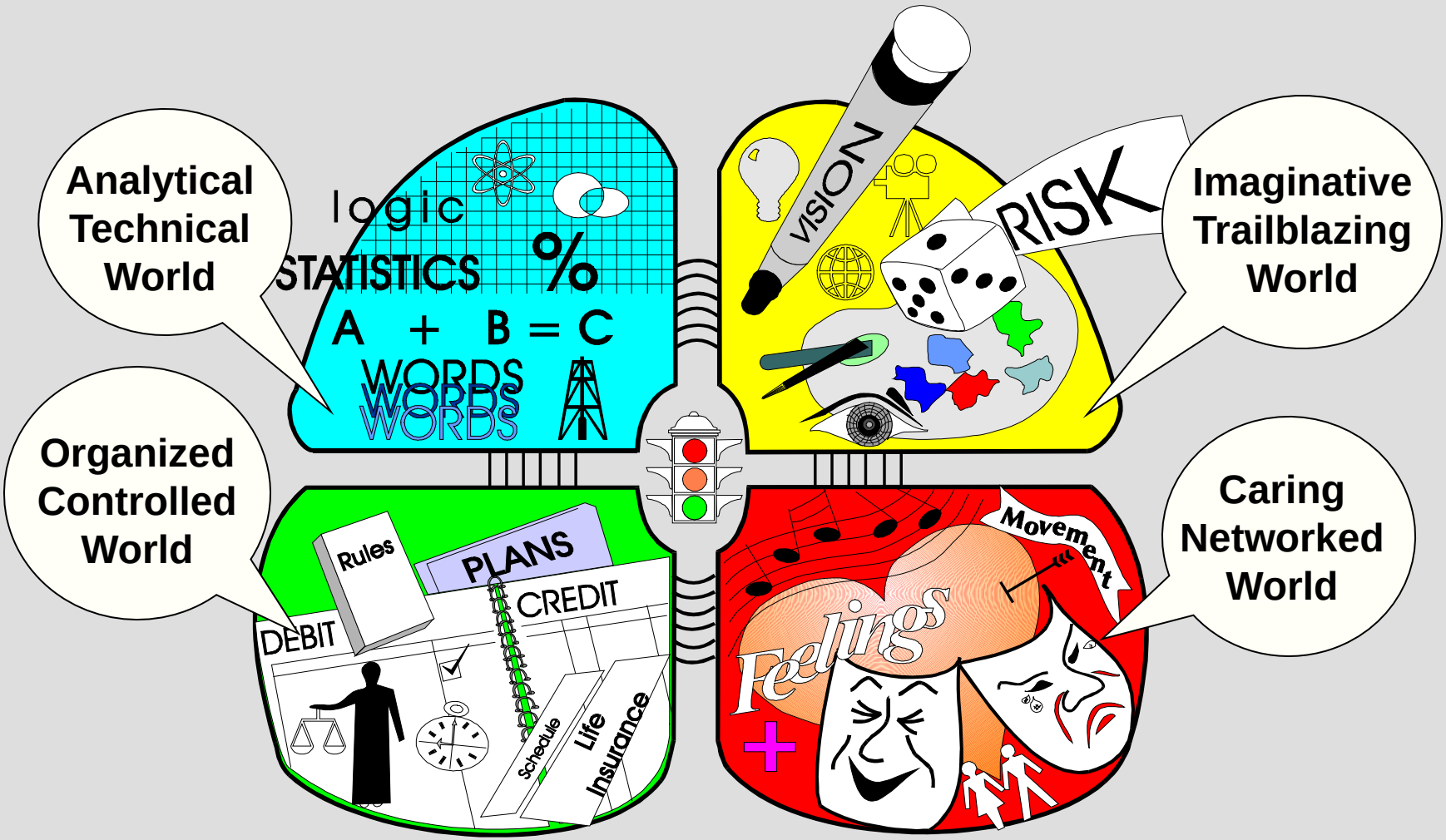
- Much of this module comes from notes used by Dr. Edward Lumsdaine at Michigan Technological University
- He is the lead author of the book
  - *Creative Problem Solving,* Edward Lumsdaine, Monika Lumsdaine, and J. William, Shelnutt, McGraw-Hill, New York, 1995 (2006)

Where in the Process?



Pre-Phase A: Design Problem Analysis

Your Brain


Analytical
Technical
World
logic
STATISTICS
%
A + B = C
WORDS
WORDS
WORDS
VISION
RISK
Imaginative
Trailblazing
World
Organized
Controlled
World
Rules
PLANS
CREDIT
DEBIT
Schedule
Life
Insurance
Movement
Feelings
Caring
Networked
World

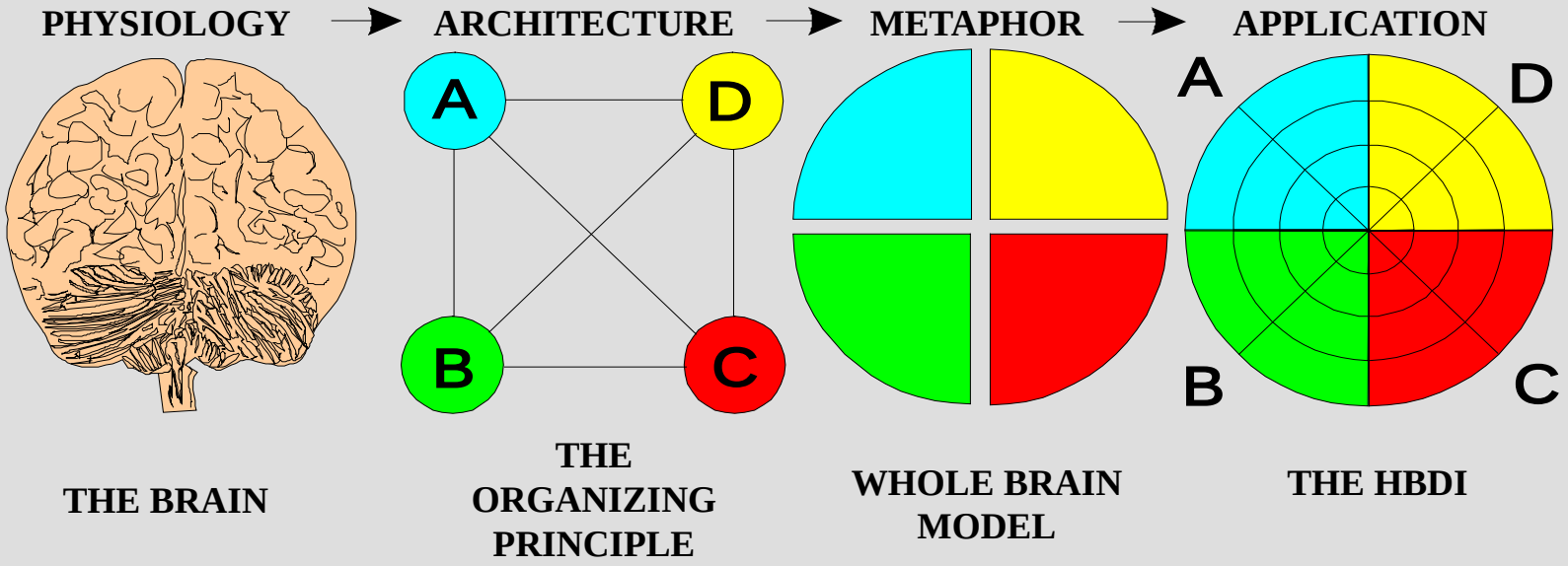
Benefits of Understanding and Using the Herrmann Brain Dominance Instrument (HBDI)

- Personal Benefits
  - Understanding the brain dominance model and your own thinking models can lead to improved teamwork and communication skills
- Organizational Benefits
  - Mentally diverse teams can obtain optimum problem solving results
  - The purposeful use of multiple thinking styles can meet the requirements of a global marketplace, diverse customers, changing technology, and innovation

(Lumsdaine *et al.*, 2006)

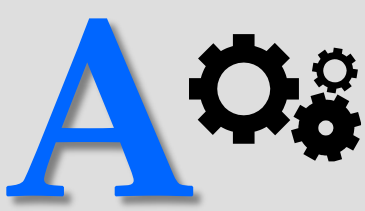
The Organizing Principle

- Four interconnected clusters of specialized mental processing modes that function together situationally and iteratively make up a whole brain in which one or more parts may become naturally dominant



(Lumsdaine *et al.*, 2006)

The Four Modes



A

What?

ANALYZER

Logical thinking
Analysis of facts
Critical evaluation
Processing numbers

D

What if?

VISUALIZER

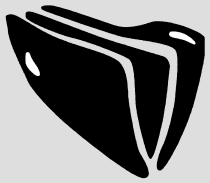
Conceptualizing
Strategic thinking
Imaginative design
Big-picture viewpoint

B

Detailed organization
Operational planning
Manuals, schedules
Preventive action

ORGANIZER

How?



PERSONALIZER

Why?

C

(Lumsdaine *et al.*, 2006)

Important Concepts in Brain Dominance

- All thinking modes and profiles are valuable; there is no right or wrong
- The HBDI is an assessment or a survey for personal development, not a test
- The brain is specialized and situational - different modes are needed for different tasks
- Each person represents a unique coalition of thinking preferences
- People with strong cross dominances need more time for decision making, because they can see situations from very different angles

(Lumsdaine *et al.*, 2006)

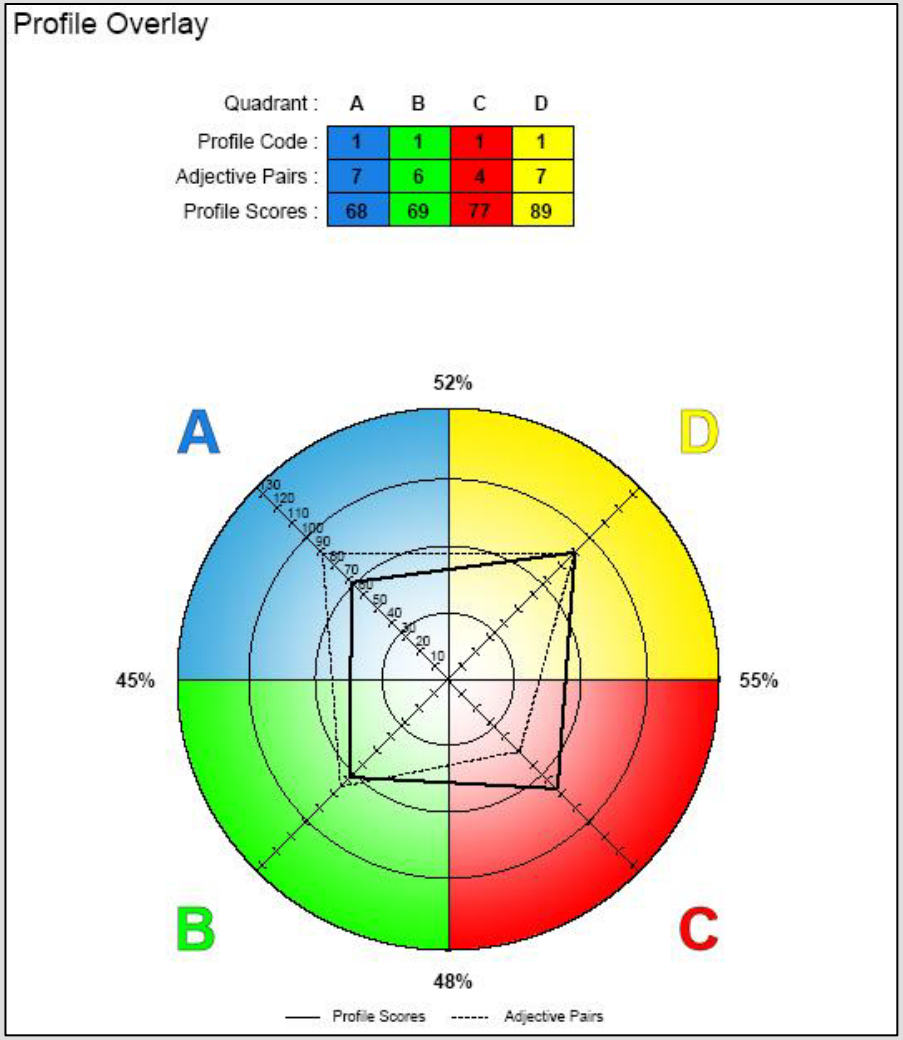
Important Concepts in Brain Dominance

- Each quadrant has its own vocabulary and “ways of knowing”
- Understanding and valuing these differences can lead to better communication and teamwork
- A whole-brain team made up of people with different strengths can improve optimum problem-solving results

(Lumsdaine *et al.*, 2006)

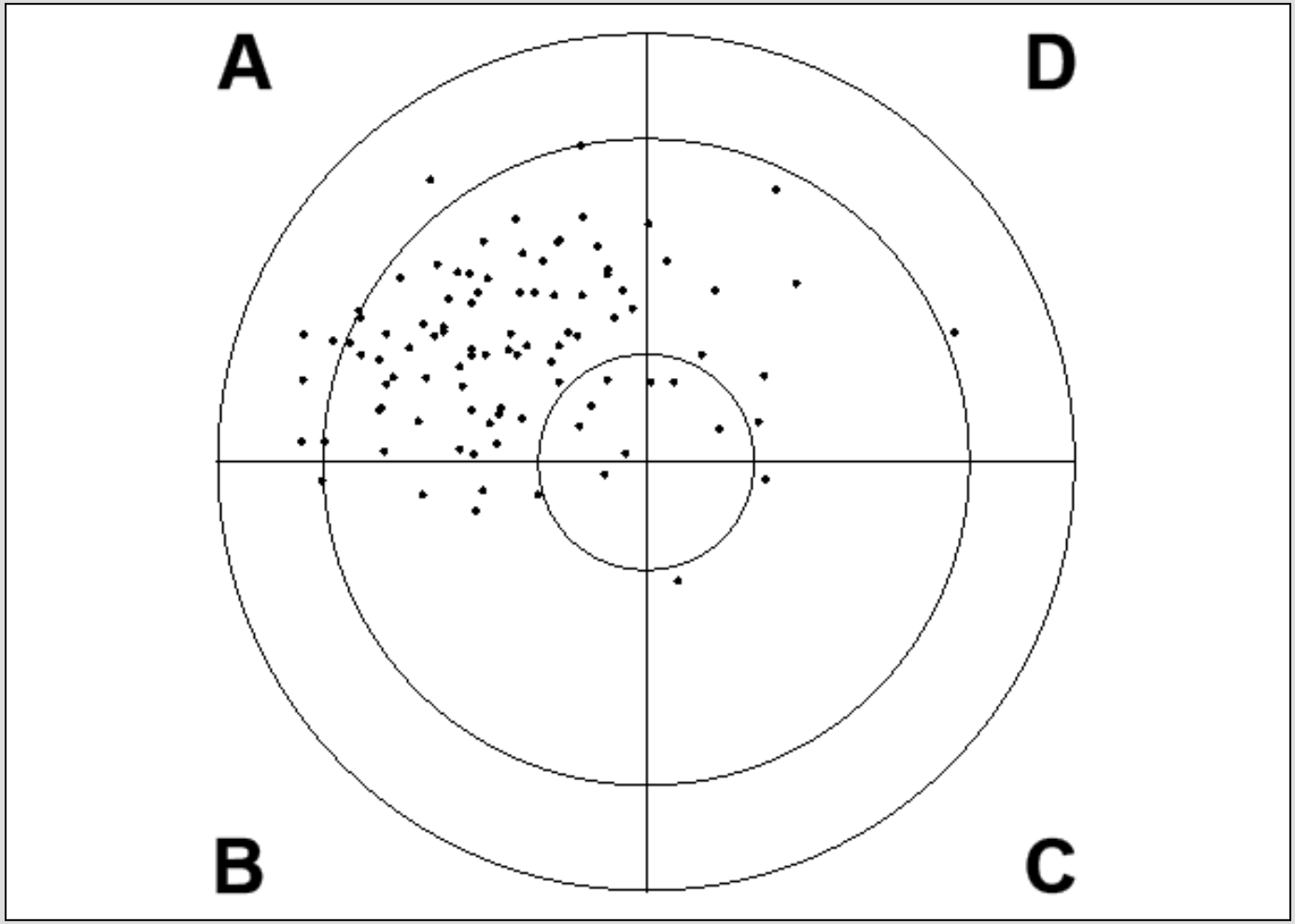
HBDI Profile Overlay

- Your name “tent” gives you a preview of your HBDI profile



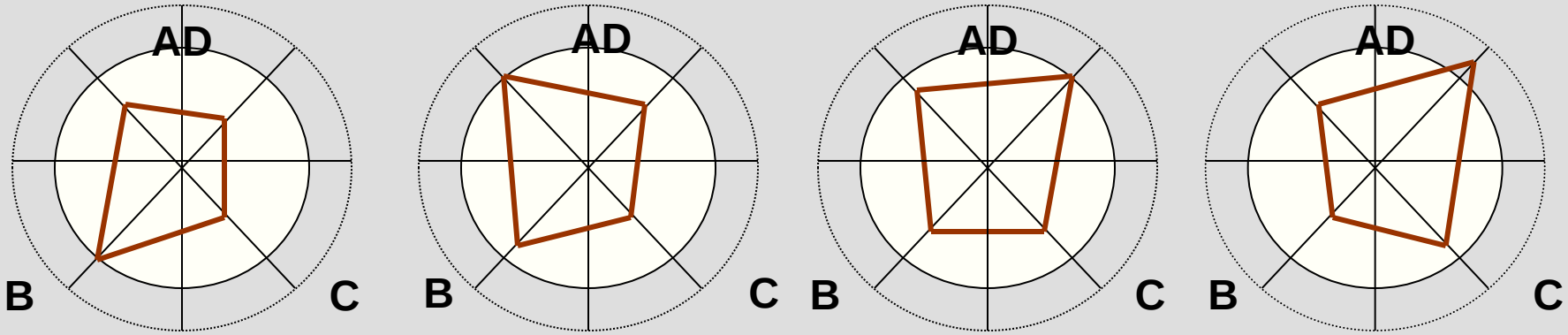
(Lumsdaine *et al*., 2006)

Dominance Map (Profile "Tilt") of Capstone Engineering Students



(Lumsdaine *et al.*, 2006)

Typical HBDI Profile of Successful Business Leaders



60s
Short Range
"Conventional Wisdom"

70s
Financial
Technical

80s
Hi-Tech
Strategic

90s
Long Range
Global

Paradigm Shift

FROM LEFT-BRAIN TO RIGHT-BRAIN THINKING

(Lumsdaine *et al.*, 2006)

Preference ≠ Competence

Mental **PREFERENCE**

- ➡ Interests
  - ➡ Motivation to learn
    - ➡ Developing **COMPETENCE**
      - ➡ Work leading to satisfaction and **SUCCESS**

Points of Interest to Engineers

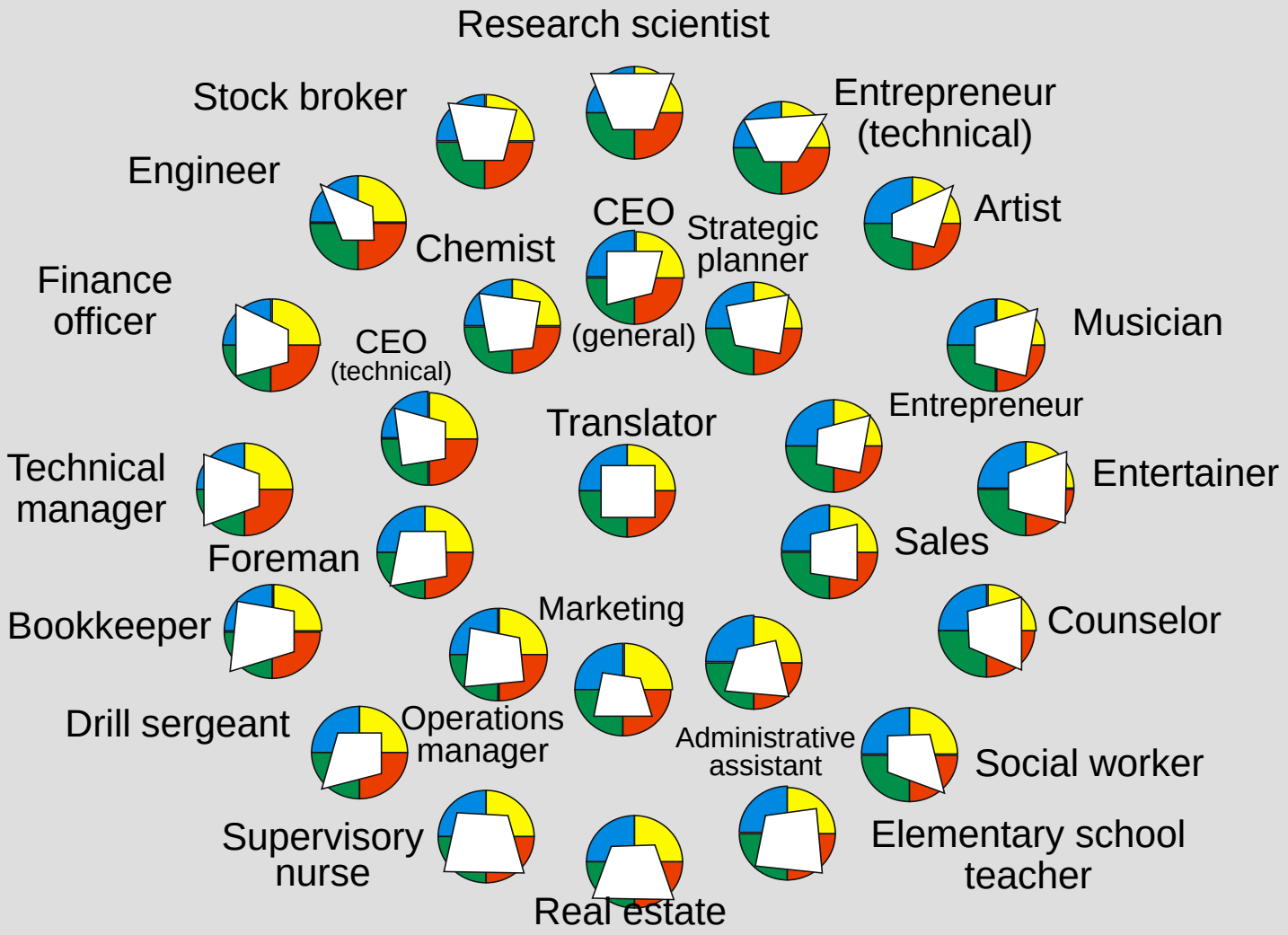
- Engineering design is whole-brain; thus most engineering students need to learn creative thinking and people skills
- A whole-brain team made up of people with different strengths can obtain optimum problem-solving results, with increases in effectiveness from 30 to 100 percent
- Research results with engineering students typically show that from 20-40% of freshmen can be right-brain thinkers; by graduation, the range is more like 10-25%

Whole Brain Approach

A Analyzer	D Synthesizer
Applying mathematical models.	Brainstorming wild and crazy ideas.
Calculating specifications.	Conceiving new approaches to design problems.
Comparing alternatives.	Creating an imaginative work environment.
Computing benefits and costs of solutions.	Creating new models of system behavior.
Drawing inferences from statistical information.	Developing metaphors for projects and goals.
Drawing physical and mathematical analogies.	Developing several competing design alternatives.
Evaluating and optimizing conceptual designs.	Drawing solutions from fields outside engineering.
Formulating reasoned, analytical approaches.	Framing problems in new formats.
Generating quantitative results.	Leading teams to innovative solutions.
Generating predictions based on math models.	Leading with vision; seeing the whole picture.
Quantifying criteria for solution evaluation.	Looking for innovation and break-through ideas.
Performing preliminary engineering analyses.	Presenting results in imaginative ways.
Solving mathematical equations.	Redefining old problems with new insights.
Separating factual data from opinion.	Recognizing opportunities for improvement.
Taking principles and data to logical conclusions.	Visualizing new connections or arrangements.
Verifying assumptions and arbitrary parameters.	Using crazy ideas as triggers to innovative concepts.
Writing computer programs.	Sketching possible design solutions.
Writing project proposals and technical reports.	Synthesizing solutions from other engineering fields.
Checking drawings for errors.	Being sensitive to team members' feelings.
Checking specifications against codes.	Brainstorming concepts with teams.
Collecting and safe-guarding project records.	Building effective relationships with all customers.
Debugging computer programs.	Communicating effectively at all stages of design.
Developing checklists.	Continuously teaching yourself/others new techniques.
Drafting bills of material.	Cultivating enthusiasm.
Expediting design details.	Developing environmentally benign concepts.
Following design procedures.	Encouraging/training coworkers in new technology.
Issuing change orders and tracking design changes.	Enjoying teamwork.
Linking complex project plans and schedules.	Involving implementers of solutions in their creation.
Optimizing procedures.	Maintaining ethics and values.
Organizing and scheduling design projects.	"Seeking first to understand, then to be understood."
Producing "as-built" drawings.	Seeking win-win solutions that benefit all parties.
Synchronizing product and process design.	Selling solutions and ideas.
Supervising design drafters.	Sensing customer needs.
Taking action to implement design plans.	Sharing goals and experiences.
Tracking project expenditures.	Using senses and intuition to define the design problem.
Updating software; scheduling required training.	Working toward synergy rather than compromise.
B Administrator	Collaborator C

(Lumsdaine *et al.*, 2006)

HBDI Occupation Examples



Communication

- When the intended communication is significant, it is necessary to design and deliver it in ways that allow for understanding to take place in all four quadrants
- “The use of illustrations, graphics, stories, examples, and metaphors greatly enhances the likelihood that the intended meaning is conveyed to a wide range of people.”

Ned Herrmann

The Whole Brain Business Book, page 119

Benefits of Good Communication

- Verbal communication skills are important to building an effective team
- Good communication is critical in times of rapid change
- Good communication lowers stress and can thus increase creativity
- A successful negotiation outcome depends on good communication

Guidelines for Negotiation and Communication

- Listen actively and acknowledge what is being said
- Provide feedback from the point of view of the other person or group by stating their position in positive terms
- Speak to be understood
- Look at the others as partners for solving a joint problem
- The more important the decision, the fewer people should be involved
- Two is best for a “summit” meeting

Guidelines for Negotiation and Communication

- Don’t condemn
- Describe the problem in terms of personal impact
  - “We feel discriminated against” is better than “you are a racist or oppressor”
- Try not to provoke a defensive reaction or anger; instead, stick to the objectives
- Take the log-term view and build relationships
- It is possible to “win the skirmish and lose the war!”

Guidelines for Negotiation and Communication

- Follow creative problem solving: do not judge too soon, look for options and alternatives, do not assume a fixed pie (either/or) concept or act in pure self-interest
  - Brainstorm-alone, with the other party, or with other interested people-then do a creative evaluation to find the best options
  - Develop a list of objective criteria
- If you are negotiating from a weak position, have a Plan B
  - This way, you will not be tempted or forced into accepting a plan that will put you too much at a disadvantage

Guidelines for Negotiation and Communication

- What if the other party won't play and follow the rules of principled negotiation? In this case, do not attack the opposing position-look behind it. Do not defend your ideas or take the attack personally. Instead, invite criticism and advice. Listen and agree as much as possible. Restate an attack on you as an attack at the problem. Reframe the opposing position by using what-if questions. Build on the proposed idea; make it easy for the other party to gain honor or a good way out. Discuss the cost of drawn-out disagreement. Most of all, treat everyone with respect.

Communication Styles

A

- Does it use facts?
- Is it quantified?
- Does it show clear analysis?
- Is it logical?
- Is it concise and to the point?
- Is the information complete?

D

- Does it look at the big picture?
- Is it visual and colorful?
- Does it use metaphors?
- Does it look at the future?
- Is it conceptually sound?
- Does it address change issues?

B

- Does it provide details?
- Does it provide schedules?
- Is it neat?
- Is it in sequential order?
- Is it in an appropriate form?
- Have you checked for errors?

C

- Does it use experiences that relate to the audience?
- Do personalized examples illustrate the point?
- Is it helpful and user-friendly?
- Are emotions acknowledged?

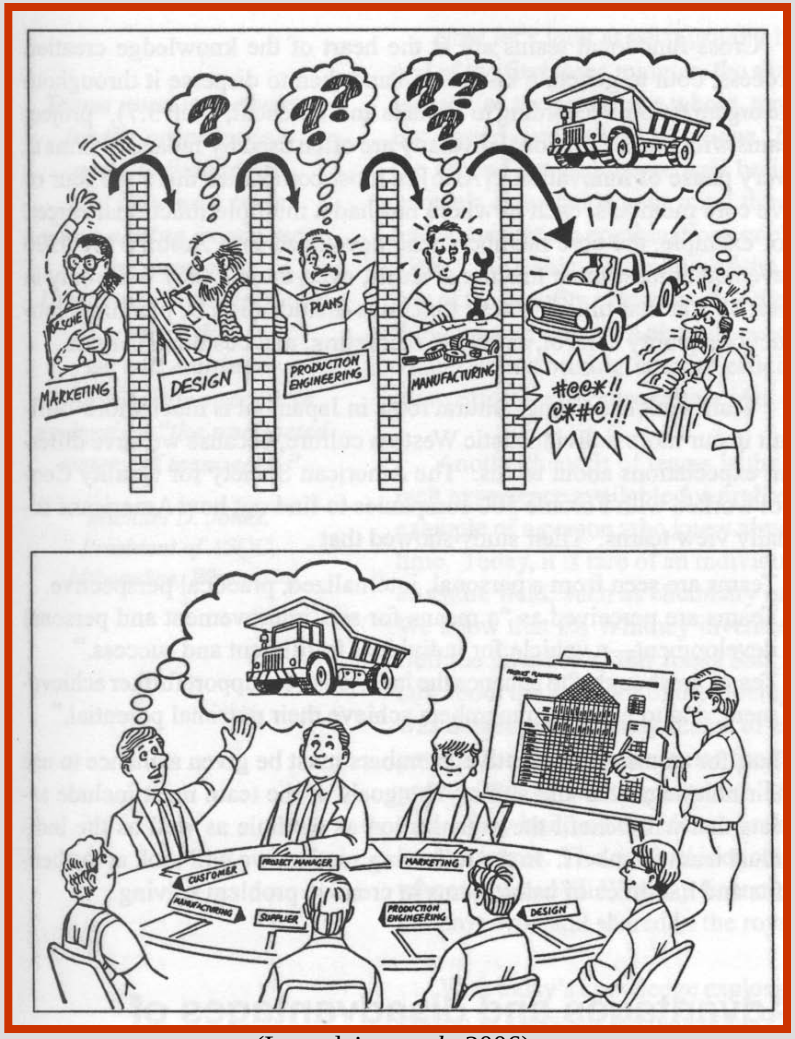
Golden Rule of Communication

- Communicate with others according to THEIR thinking preference, not according to your own

Communication in Design and Engineering

- Communication is integral to the design process - rarely is a drawing alone sufficient
- The effectiveness of a design can be impaired by faulty communication
- All designs must be sold; most must be sold many times - and to different stakeholders

Teamwork in Engineering Today

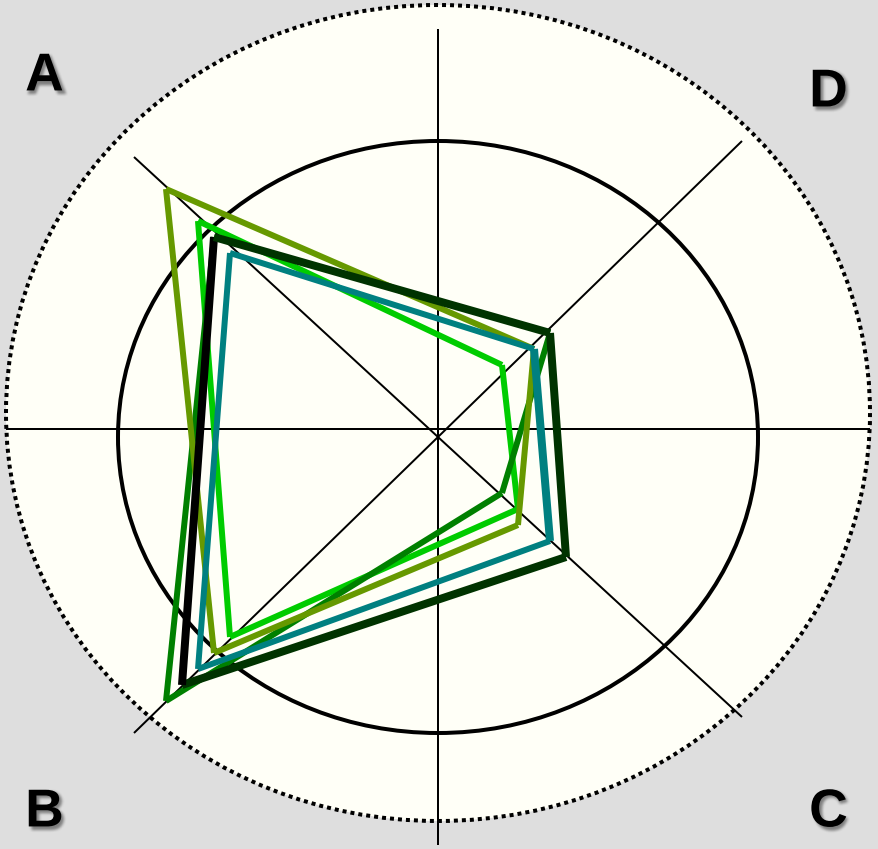


(Lumsdaine *et al.*, 2006)

- Traditional Engineering
  - People work in isolation
  - Little or no interaction between departments and functions
- Concurrent Engineering
  - People involving all functions work in teams
  - Customers and suppliers are involved right from the start in the design process

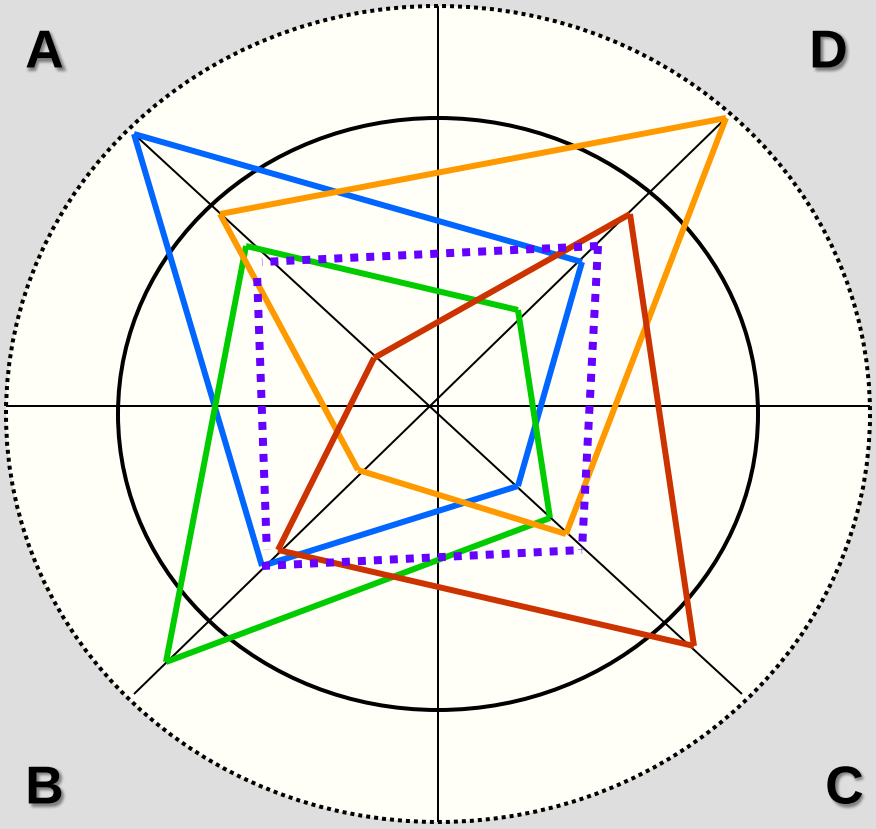
Two Types of Teams

Homogeneous Teams



Quadrant A+B team

Heterogeneous Teams



The dotted profile is a “translator”

Developing Individual Characteristics of Good Team Members

- Effective team members are mostly made, not born
- Teaming does not come easy to people with very strong quadrant A, B, and D thinking preferences and a low preference for C thinking
  - Quadrant A: Learn to give constructive comments (in C)
  - Quadrant D: Learn good time management skills (in B)
- Use the language of the mental models to depersonalize tension

Stages in Team Development

- Forming
- Storming
- Norming
- Performing

Forming

- When the team is first formed, team members act like individuals
- They look out for themselves and are not contributing to the group as a whole
- Members cautiously get to know one another

Storming

- Not getting much done prompts disagreements, blame, and impatience
- Some team members try to do the work on their own, and others question the whole purpose of the team
- Tension, disunity, and jealousy result

Norming

- When the team's objectives are worked out collectively, the members are drawn together into a group, while still having a strong sense of individual autonomy
- Achieving some success, the group begins to realize that team development is important
- Members become more cooperative, try to avoid conflict, and work out their differences
- The team becomes a priority

Performing

- Team members have accepted each other's strengths and weaknesses and have defined workable team roles
- The team becomes an effective, productive, cohesive unit
- Team members feel attached to the team and confident of its abilities
- The team may become increasingly self-directed
- Team members fully share accountability for the team's actions, and they operate from a basis of trust and mutual respect

Two Detrimental Behaviors Common to Teams of Engineers

- Automatically discounting emotional arguments
  - Solution: Quadrant A people must learn to listen to and value the input of quadrant C people - they have important insights about people (customers and team development) that might be missed
- Ignoring people who have unorthodox
  - Solution: Quadrant A (and B) people can learn to listen to and appreciate the ideas of creative thinkers; these ideas, when improved and implemented by the team, may be crucial for the team's success and survival

Team Tools

- Mission Statement
- Timetable or Project Plan
- Team Member Roles
- Team Ground Rules
  - Spending time upfront defining ground rules can save time later
  - Rules must be accepted by every member
  - Rules can be changed
- Meeting Agendas
  - Stay on track with the “Parking Lot” technique
- Meeting Notes (a template may be useful)
- Peer Contribution Rating Forms

Mission Statement

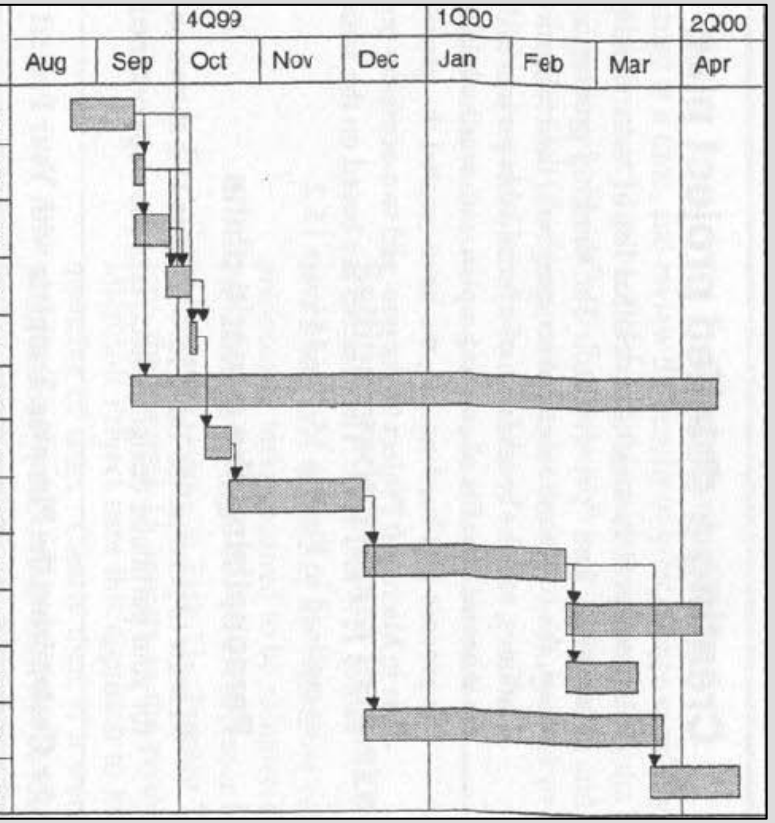
Team Charge or Mission Statement. A sponsor or manager may charge a team to accomplish a certain task or set of tasks. Frequently, however, the sponsor does not have enough information to define the task well. It becomes the team's job to re-articulate the mission in detail and in terms the members understand. Then the team must present the refined mission statement to the sponsor for approval. This process is typically very helpful in defining the problem to be addressed, acknowledging expectations of the team, limiting the scope of the task(s), and specifying constraints under which the team is to work. Regardless of whether the team defines its own mission or works under the charge of a sponsor, a well-defined mission statement can keep the team focused on the right objectives. A team mission statement should include

- ❑ A statement of the overall purpose of the team and any particular problems to be solved;
- ❑ A reference to the customers or stakeholders the team is serving, specifically mentioning their contacts or representatives;
- ❑ A statement of scope and a list of constraints within which the team is to work (limited geographic area, specified manufacturing plant, other qualifying assumptions);
- ❑ The time frame in which the team is to complete its work;
- ❑ The budget within which the team is to work;
- ❑ A list of deliverables expected of the team, with anticipated completion dates (i.e., plan of action, progress report, conceptual designs, "best" solution, and final report).

(Lumsdaine *et al.*, 2006)

Time Table / Project Plan

ID	Task Name	Duration	Start	Finish
1	Step 1 – Identify Forces Driving Design	15 days	Mon 8/23/99	Mon 9/13/99
2	Step 2 – Identify Constraints	3 days	Tue 9/14/99	Thu 9/16/99
3	Step 3 – Identify User Needs	11 days	Tue 9/14/99	Tue 9/28/99
4	Step 4 – Define Objectives or Specifications	6 days	Wed 9/29/99	Wed 10/6/99
5	Step 5 – Write Design Problem Statement	2 days	Thu 10/7/99	Fri 10/8/99
6	Step 6 – Plan Design Process to Stay on Track	120 days	Tue 9/14/99	Wed 4/12/00
7	Step 6A – Develop Design Project Proposal	8 days	Tue 10/12/99	Thu 10/21/99
8	Step 7 – Develop Alternative Concepts	30 days	Fri 10/22/99	Tue 12/7/99
9	Step 8 – Complete System Level Design	30 days	Wed 12/8/99	Fri 2/18/00
10	Step 9 – Complete Detail Design for Production	30 days	Mon 2/21/00	Fri 4/7/00
11	Step 10 – Test the Effectiveness of the Design	15 days	Mon 2/21/00	Fri 3/17/00
12	Step 11 – Review, Assess, Evaluate the Design	50 days	Wed 12/8/99	Fri 3/24/00
13	Step 12 – Refine and Improve the Design	20 days	Tue 3/21/00	Mon 4/17/00



(Lumsdaine *et al.*, 2006)

Team Member Roles

Team Member Roles. Whether assigned roles for team members rotate or are fixed by the team charge, time spent in defining these roles so the team clearly understands the responsibilities involved will prove very useful. Although some special roles may evolve from the particular team charge and activities (as outlined in the earlier section on team development), the following basic roles are recommended for any team:

Note Taker—the person who summarizes task reports from team members, records team decisions, lists tasks assignments (dates and persons), and sends this summary along with the agreed-upon agenda for the next meeting to all team members.

Process Observer—the team member who observes how well the team meeting process and the tasks assignment procedures are working and who may make suggestions for improvements (like an internal auditor). This role is often neglected but can be crucial for inexperienced teams. Although it is tempting to permanently assign this role to a whole-brain member who has good communication skills, team learning and development may be served better if all members can gain experience with this role.

Leader—the spokesperson for the team and the person who typically calls meetings, reports to management, and conducts the meetings.

Meeting Leader—the team member who assumes the leader role for a particular meeting. Sometimes this person is chosen for a series of meetings because of his or her expertise or thinking preferences.

(Lumsdaine *et al.*, 2006)

Team Ground Rules

To promote team productivity and harmony, we agree individually and collectively to abide by the following rules until the team amends or rescinds them:

1. We agree to treat each other with respect and courtesy the way we want to be treated.
2. We agree to make team decisions by consensus.
3. We agree that any team discussion may be shared outside the team unless a team member asks that it be treated confidentially.
4. We agree to be on time to each team meeting, and we will notify the meeting leader in advance when we will be late or absent.
5. We agree individually to complete work assigned to us on time, to notify the team leader in advance if the work cannot be completed as scheduled, and to send the work by other means if we cannot attend the meeting on the work's due date.
6. We agree to attend team meetings every _____ (weekday) at _____ (time) at the following location: _____ .
7. Each one of us agrees to check e-mail daily and to notify other team members promptly by e-mail of any significant developments in the work of the team.
8. We agree that we will share and rotate the roles of meeting leader, note-taker, and process observer. The roles will be assigned at the end of each meeting for the following meeting.

(Lumsdaine *et al.*, 2006)

Meeting Notes

Meeting Notes. The team member designated as the meeting note taker assumes responsibility for recording the business actions of the team. These notes should not be verbatim "minutes" but should include:

- ❑ A record of the meeting date, time, and attendees.
- ❑ A summary of the progress reports of team members with assignments made at previous meetings.
- ❑ Decisions of the team.
- ❑ New assignments—by team member and date to be completed.
- ❑ Comments and suggestions from the process observer, along with actions the team wants to take based on these observations.
- ❑ The date, time, and agenda for the next meeting, including designations for the meeting leader, note taker, and process observer if these are to change for the next meeting.

(Lumsdaine *et al.*, 2006)

Peer Contribution Rating Form

Peer Contribution Rating Form

Purpose: This form is used to allow team members to rate the contributions of fellow team members. The results during the term are used to identify problems and give the team an opportunity to improve. The results at the end of the course may be used in determining individual performance grades. Your input will remain anonymous and will not be revealed to anyone else on the team.

Instructions:

1. Fill out this form, sign it, place in a business envelope, and return it to your instructor by the due date.
2. Evaluate each member according to his or her contribution to the team effort. Circle the appropriate response on the following scale: **P = poor, A = adequate or average, T = tops.**
   - A. **Quality**—value and quality of contributions, suggestions, opinions, ideas, creativity.
   - B. **Quantity**—participation, sharing of responsibility, attendance at team meetings, willingness to do his or her share of the work, preparation for meetings.
   - C. **Attitude**—if poor, indicate the nature of the perceived problem (confrontational, negative, indifferent, lazy, bossy, non-cooperative, etc.) in the space at the bottom of the form.
   - D. **Contribution** (in percent) to the entire team's work of each team member. The total of all contributions must equal 100%.
   - E. **Yes or No**: "Would you choose this individual to be on your next team?" If no, offer one or two constructive ideas on how the team member could improve, using the back of the form.
3. If desired, you can also highlight one or two outstanding contributions made to the team by a particular member. Use the space at the bottom of the form (or the back, if you need more space).

Your Name _____ Team Name/No. _____

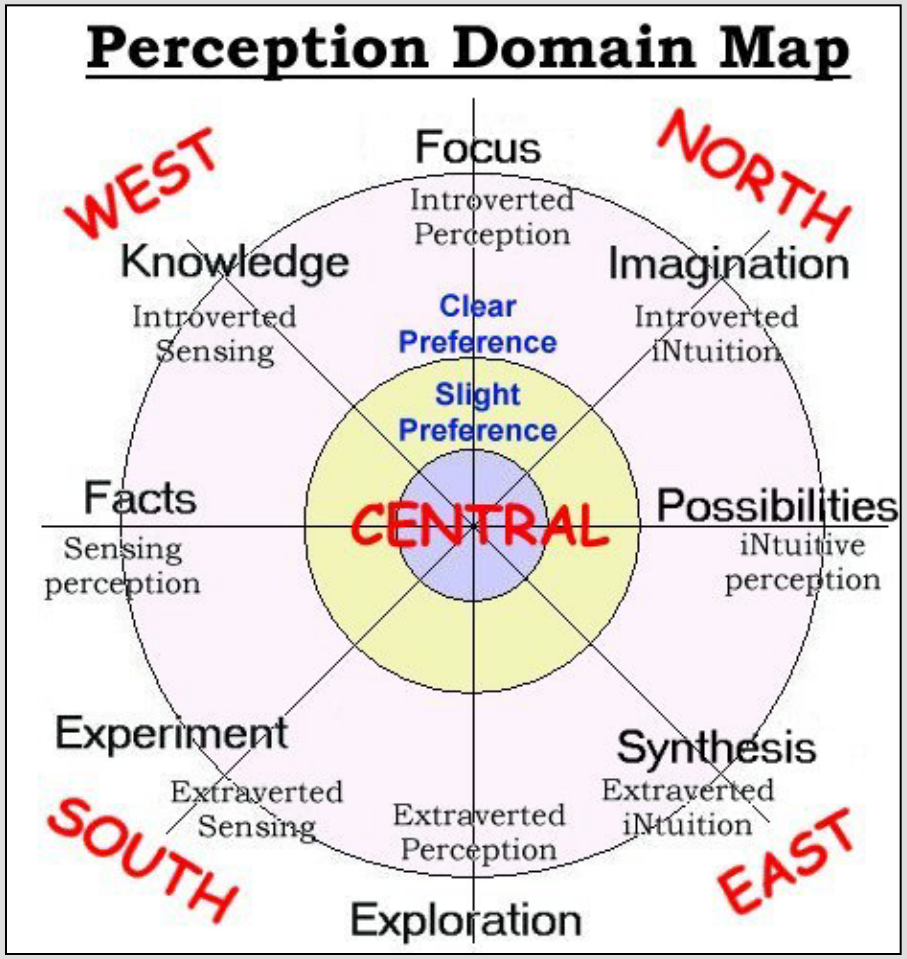
Full name of team members	A Quality	B Quantity	C Attitude	D %	E Yes or No
1. _____	P A T	P A T	P A T	__	yes no
2. _____	P A T	P A T	P A T	__	yes no
3. _____	P A T	P A T	P A T	__	yes no
4. _____	P A T	P A T	P A T	__	yes no
5. _____	P A T	P A T	P A T	__	yes no
6. _____	P A T	P A T	P A T	__	yes no
7. _____	P A T	P A T	P A T	__	yes no
8. _____	P A T	P A T	P A T	__	yes no
				100	

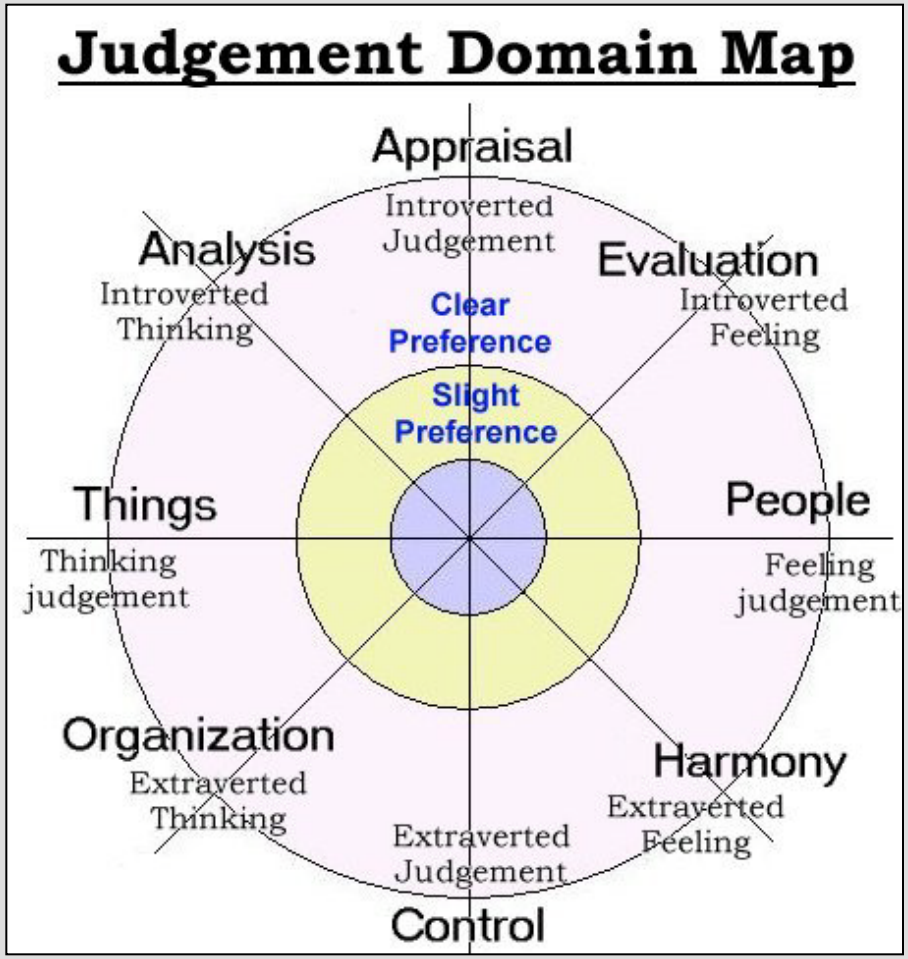
Problems:

Praise:

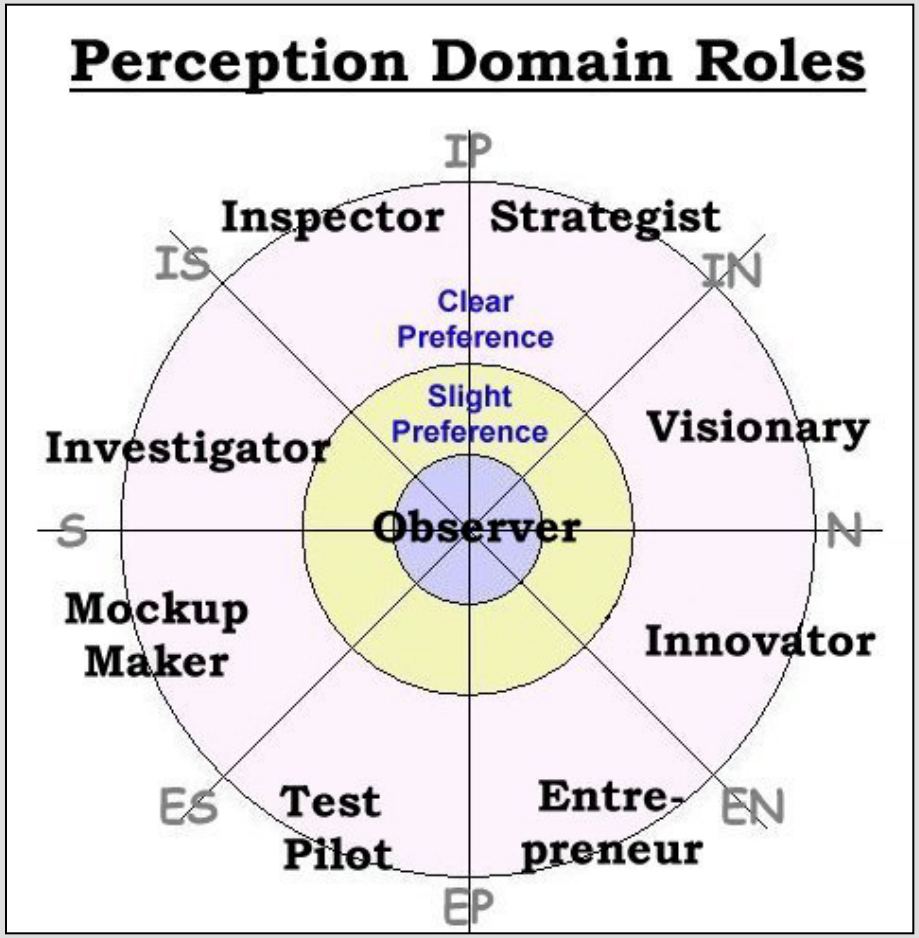
(Lumsdaine *et al.*, 2006)

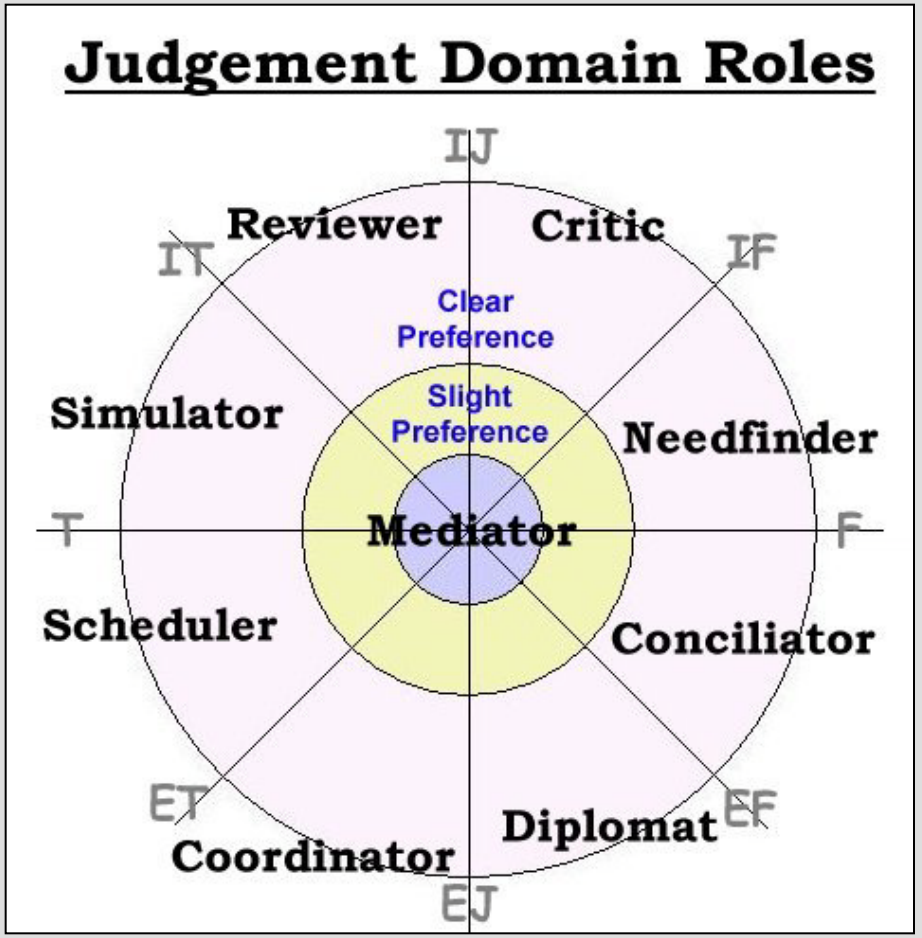
Personality Map





Team Roles


Perception Domain Roles
IP
Inspector
Strategist
IS
IN
Clear Preference
Slight Preference
Investigator
Visionary
S
Observer
N
Mockup Maker
Innovator
ES
Test Pilot
Entre-preneur
EN
EP


Judgement Domain Roles
IJ
Reviewer
Critic
IT
IF
Clear Preference
Slight Preference
Simulator
Needfinder
T
Mediator
F
Scheduler
Conciliator
ET
Coordinator
Diplomat
EF
EJ

Team Member Responsibilities

- Teams outperform individuals
- Take responsibility for team success
- Deliver on commitments
- Contribute to discussions
- Develop techniques to get your message across
  - Avoid put downs and sarcasm
  - Don't ramble
- Give and receive feedback
- RESPECT

Effective Teams

- We will be as open as possible but will honor the right for privacy
- Information discussed in team will remain confidential
- We will respect differences between individuals
- We will respect the ideas of others
- We will be supportive rather than judgmental
- We will give feedback directly and openly, in a timely fashion; feedback will be specific and focus on the task and process and not on personalities
- We will all be contributors to the team
- We will be diligent in attending team meetings

Effective Teams

- When members miss meetings, we will share the responsibility of keeping them up to date
- We will use our time wisely, starting on time, returning from breaks, and ending our meeting promptly
- We will keep our focus on our goals avoiding sidetracking, personality conflicts and hidden agendas. We will acknowledge problems and deal with them.
- We will not make phone calls and interrupt the team during meetings

Team Leadership

Characteristics of three leadership types

Traditional leader	Passive leader	Facilitative leader
Directive and controlling	Hands off	Creates open environment
No questions—just do it	Too much freedom	Encourages suggestions
Retains all decision-making authority	Lack of guidance and direction	Provides guidance
Nontrusting	Extreme empowerment	Embraces creativity
Ignores input	Uninvolved	Considers all ideas
Autocratic	A figurehead	Maintains focus; weighs goals vs. criteria

(Dieter *et al*., 2000)

Successful Meetings

1. Pick a regular meeting location and try not to change it.
2. Pick a meeting location that: (a) is agreeable and accessible to all (unless your team is trying to "get away"), (b) has breathing room when there is full attendance plus a guest or two, (c) has a pad or easel in the room, and (d) isn't too hot, too cold, or too close to noisy distractions.
3. Regular meeting times are not as important as confirming the time of meetings. Once a meeting time has been selected, confirm it immediately in writing (e-mail or memo). Remain flexible on selecting meeting length and frequency. Shape the time that the team spends together around the needs of the work to be accomplished.
4. Send an e-mail reminder to team members just before the first of several meetings.
5. If you send materials out in advance of a meeting, bring extra copies just in case people forget to bring theirs, or it did not arrive. Do not send out agendas or reading materials in advance unless you give people at least four business days to look things over.
6. Start on time, or no later than 5 to 7 minutes from the stated starting time.
7. Pass out an agenda at the beginning of the meeting and get the team's concurrence to the agenda. Start every meeting with "what are we trying to accomplish today?"
8. Rotate the responsibility for writing meeting summaries of each meeting. The summaries should document: (a) when did the team meet, (b) what were the issues discussed (in outline form), (c) decisions, agreements, or apparent consensus on issues, (d) next meeting date and time, and (e) "homework" for next meeting. In general, meeting summaries should not exceed one page, unless you are attaching results from group brainstorming, lists of issues, ideas, *etc*. Meeting summaries should be distributed by the assigned recorder within 48 hours of the meeting.

Successful Meetings

9. Notice members who come late, leave early, or miss meetings. Ask if the meeting time is inconvenient or competing demands are keeping them from meetings. Ask if the team sponsor could help by talking with their supervisor.
10. Observe team members who are not speaking. Near the end of the discussion, ask them directly for their opinion on an issue. Consult them after the meeting to be sure that they are comfortable with the team and discussion.
11. Occasionally use meeting evaluations (perhaps every second or third meeting) to gather anonymous feedback on how the group is working together. Meeting evaluations should be turned in to the facilitator, who should summarize the results, distribute a copy of those results to everyone, and lead a brief discussion at the next meeting on reactions to the meeting evaluations and any proposed changes in the meeting format.
12. Do not bring guests or staff support or add team members without seeking the permission of the team.
13. Avoid canceling meetings. If the team leader cannot attend, an interim discussion leader should be designated.
14. End every meeting with an "action check": (a) what did we accomplish/agree upon today? (b) what will we do at the next meeting? (c) what is everyone's "homework," if any, before the next meeting?
15. Follow up with any person who does not attend, especially people who did not give advance notice. Call to update them about the meeting and send them any materials that were passed out at the meeting. Be sure they understand what will take place at the next meeting.

02. Team Organization

NASA ESMD Capstone Design

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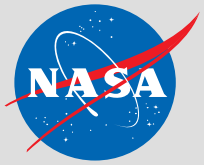
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